1. D.Luo, L.A.Thompson, D.K.Detterman. The criterion validity of tasks of basic cognitive processes. Intelligence, Vol.34, 2006. - pp. 79-120.
2. D.Luo: Department of Psychology, Indiana University of Pennsylvania, PA 15705, United States, Tel.: +1 724 357 4518; fax: +1 724 357 2214. E-mail address: dluo@iup.edu
L.A.Thompson, D.K.Detterman : Case Western Reserve University, United States.
3. The present study evaluated the criterion validity of the aggregated tasks of basic cognitive processes (TBCP). In age groups from 6 to 19 of the Woodcock-Johnson III Cognitive Abilities and Achievement Tests normative sample, the aggregated TBCP, i.e., the processing speed and working memory clusters, correlate with measures of scholastic achievement as strongly as the conventional indexes of crystallized intelligence and fluid intelligence. These basic processing aggregates also mediate almost exhaustively the correlations between measures of fluid intelligence and achievement, and appear to explain substantially more of the achievement measures than the fluid ability index. The results from the Western Reserve Twin Project sample using TBCP with more rigorous experimental paradigms were similar, suggesting that it may be practically feasible to adopt TBCP with experimental paradigms into the psychometric testing tradition. Results based on the latent factors in structural equation models largely confirmed the findings based on the observed aggregates and composites.
4. Д.Луо, Л.А.Томпсон, Д.К.Деттерман. Критериальная валидность задач на базовые когнитивные процессы.
5. В настоящем исследовании оценивалась критериальная валидность агрегированных задач на базовые когнитивные процессы (TBCP). В возрастных группах от 6 до 19 лет из нормативной выборки теста когнитивных способностей и достижений Вудкок-Джонсон III агрегированные TBCP, включающие кластеры скорости переработки и рабочей памяти, коррелируют с измерениями школьной успеваемости столь же сильно, как и конвенциональные меры кристаллизованного и флюидного интеллекта. Эти совокупные меры базовой переработки информации также практически исчерпывающе опосредуют корреляции между измерениями флюидного интеллекта и достижений, и объясняют значимо больше в мерах достижений, чем показатель флюидных способностей. Результаты анализа выборки из Western Reserve Twin Project с использованием TBCP с более строгой экспериментальной парадигмой были схожими, что позволяет предположить, что могла бы быть практически осуществимой адаптация TBCP с экспериментальной парадигмой к психометрической тестовой традиции. Результаты, основанные на

латентных факторах линейно-структурных моделей, во многом подтвердили результаты, полученные на наблюдаемых совокупностях задач.

6. Приложения:

Рисунок 1.

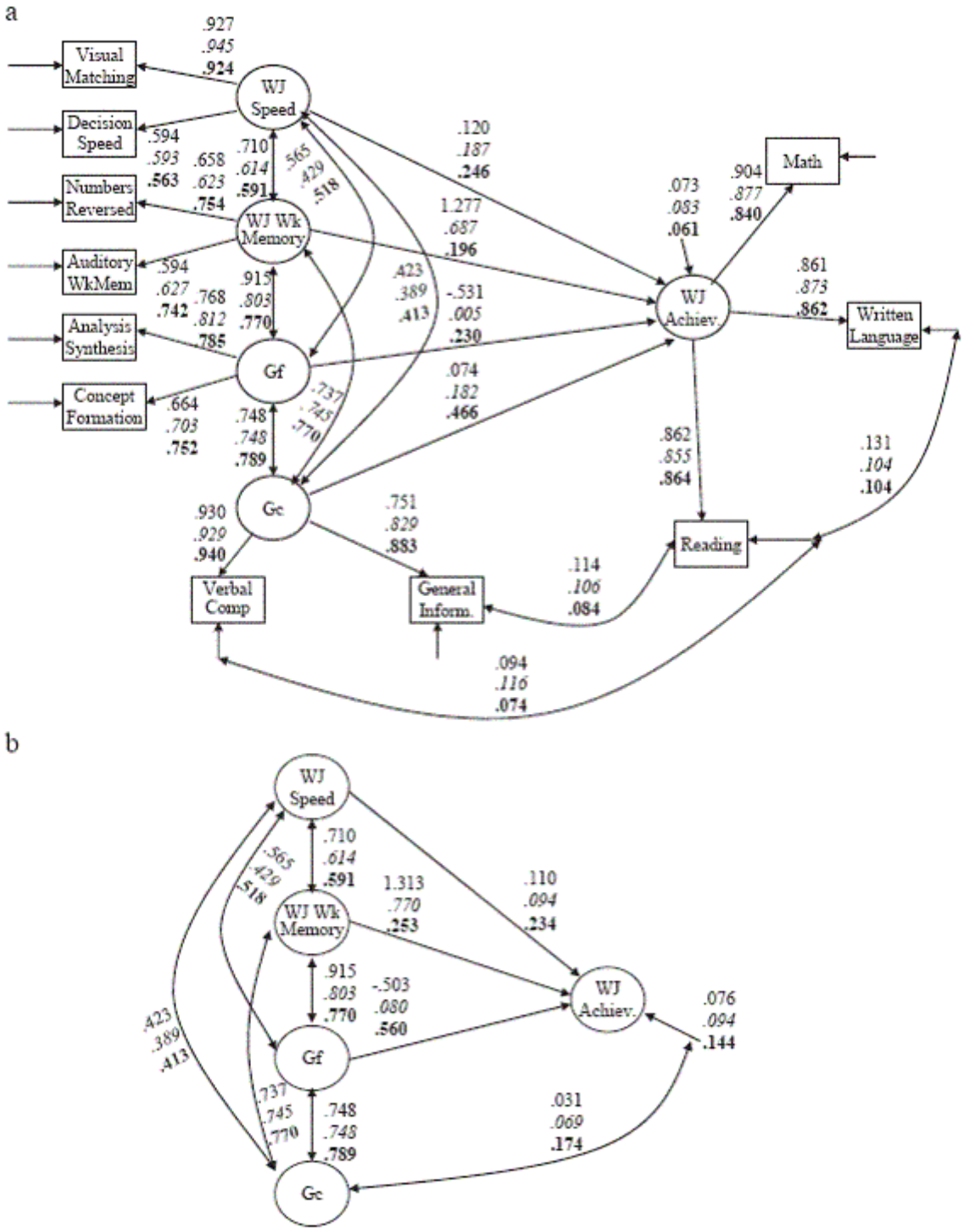
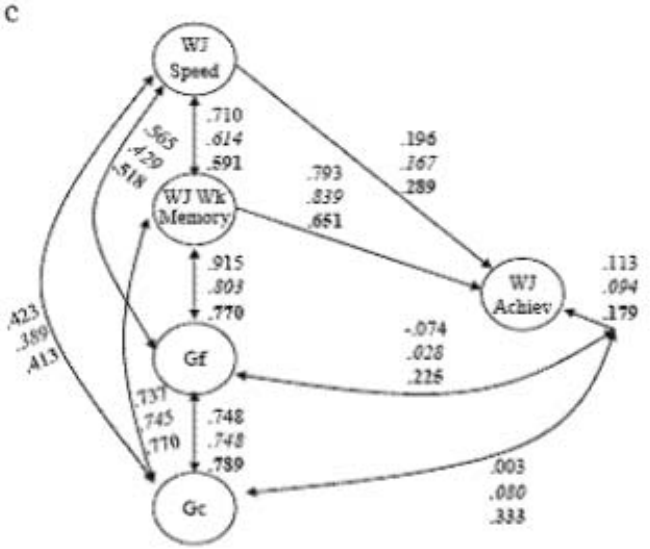


Рисунок 1 (продолжение).

c



d

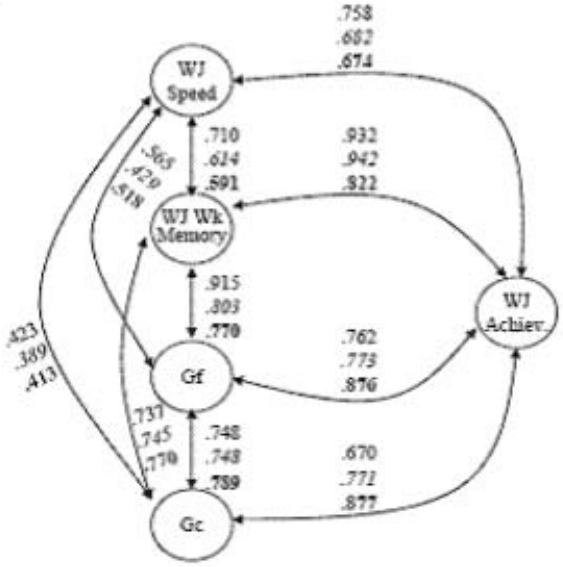
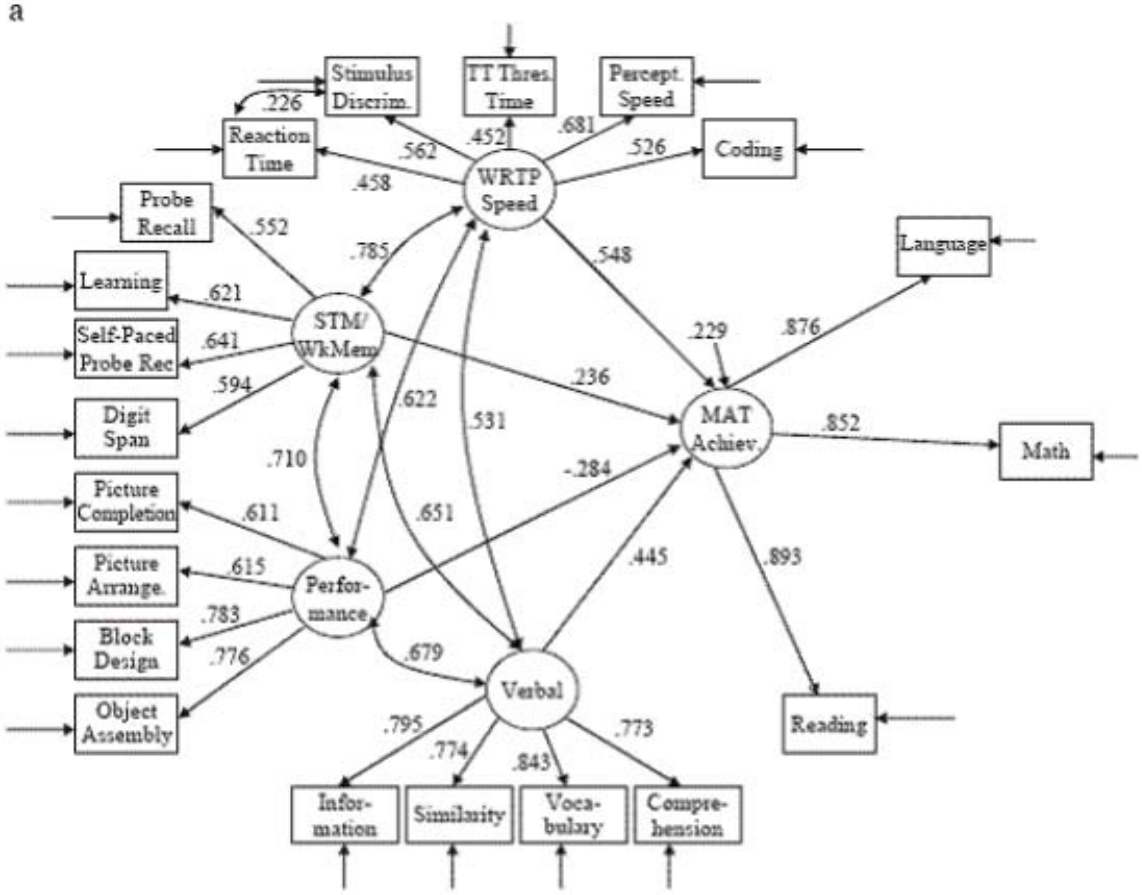


Рисунок 2.

a


Stimulus Discrim.
TT Thres. Time
Percept. Speed
.226
Reaction Time
.562
.452
.681
.526
Coding
.458
WRTP Speed
Probe Recall
.552
.785
.548
Language
Learning
.621
STM/ WkMem
.229
.876
Self-Paced Probe Rec
.641
.236
.594
Digit Span
.622
.531
MAT Achiev.
.852
Math
.710
-.284
Picture Completion
.611
.651
Picture Arrange.
.615
Perfor-mance
.445
.893
.783
Block Design
.679
.776
Verbal
Object Assembly
.795
.773
Reading
.774
.843
Infor-mation
Similarity
Voca-bulary
Compre-hension

b


WRTP Speed
.622
.785
.540
STM/ WkMem
.393
.531
.710
MAT Achiev.
.322
-.088
Perfor-mance
.651
.679
.214
Verbal

Рисунок 2 (продолжение).

c

d

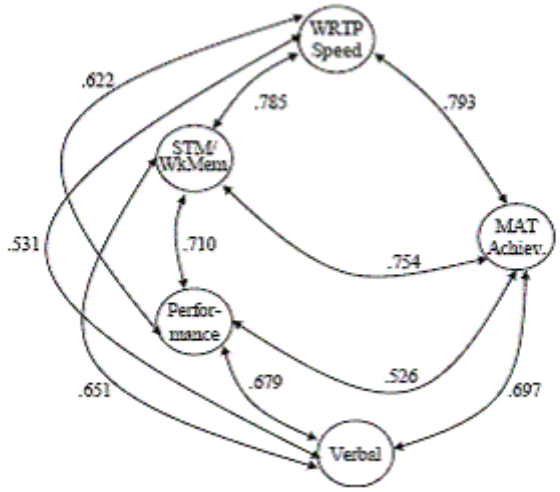


Table 1
R^2s and R^2 increments on composition levels 1, 2, and 3 of the W-J III data analysis

	Criterion measure: WJ Total Achievement					
	Age: 6–8, *N*=1095		Age: 9–13, *N*=2241		Age: 14–19, *N*=1641	
	R^2	ΔR^2	R^2	ΔR^2	R^2	ΔR^2
Composition Level 1						
Working Memory Cluster	0.360		0.360		0.397	
Processing Speed and Working Memory Clusters	0.475	0.115	0.494	0.134	0.523	0.126
Processing Speed Cluster	0.348		0.336		0.360	
Processing Speed and Working Memory Clusters	0.475	0.127	0.494	0.158	0.523	0.163
Processing Speed Cluster	0.348		0.336		0.360	
Processing Speed and Fluid Reasoning Clusters	0.436	0.088	0.467	0.131	0.539	0.179
Fluid Reasoning Cluster	0.281		0.303		0.410	
Processing Speed and Fluid Reasoning Clusters	0.436	0.155	0.467	0.164	0.539	0.129
Fluid Reasoning Cluster	0.281		0.303		0.410	
Working Memory and Fluid Reasoning Clusters	0.423	0.142	0.438	0.135	0.520	0.110
Working Memory Cluster	0.360		0.360		0.397	
Working Memory and Fluid Reasoning Clusters	0.426	0.063	0.438	0.078	0.520	0.113
Composition Level 2						
Fluid Reasoning Cluster	0.281		0.303		0.410	
Processing Speed+Working Memory Composite and Fluid R Cluster	0.504	0.223	0.538	0.235	0.597	0.187
Processing Speed+Working Memory Composite	0.475		0.494		0.522	
Processing Speed+Working Memory Composite and Fluid R Cluster	0.504	0.029	0.538	0.044	0.597	0.075
Comprehension Knowledge Cluster	0.348		0.462		0.563	
Processing Speed+Working Memory Composite and Comp K Cluster	0.554	0.179	0.645	0.183	0.715	0.152
Processing Speed+Working Memory Composite	0.475		0.494		0.522	
Processing Speed+Working Memory Composite and Comp K Cluster	0.554	0.079	0.645	0.151	0.715	0.193
Comprehension Knowledge+Fluid Reasoning Composite	0.410		0.488		0.596	
Processing Speed+Working Memory Composite and Comp K+Fluid R Composite	0.551	0.141	0.623	0.135	0.698	0.102
WJ Processing Speed+Working Memory Composite	0.475		0.494		0.522	
Processing Speed+Working Memory Composite and Comp K+Fluid R Composite	0.551	0.076	0.623	0.129	0.698	0.176
Composition Level 3						
General Intellectual Ability Index	0.518	0.563	0.656			
Processing Speed+Working Memory+Fluid R Composite	0.498	0.535	0.597			
Processing Speed+Working Memory+Comp K+Fluid R Composite	0.548	0.623	0.696			

Note: The R^2 values listed in two adjacent rows are obtained from two multiple regression models employing the indicated predictors. The model in the bottom row employs an additional predictor not included in the model above, and the ΔR^2 value stands for the R^2 increment caused by the additional predictor.

Table 2
Results from SEM analyses of W-J III Data (Age: 6–19, N=4979)

	Multi-group model fit indexes of the five-factor model				
	χ^2	df	TLI	CFI	RMSEA (95% confidence interval)
Null	35126.626	198			
Inv. Factorial Rel.	1026.455	138	0.964	0.975	0.060 (0.056, 0.064)
Inv. Observed Resid.	1009.364	121	0.958	0.975	0.064 (0.059, 0.068)
Congeneric	741.926	94	0.973	0.987	0.058 (0.052, 0.063)

Contributions of the WJ Speed, WJ Working Memory, Gf, and Gc Factors to the WJ Achievement Factor

Predictors in model	R^2 changes in achievement factor					
	6–8		9–13		14–19	
	R^2	ΔR^2	R^2	ΔR^2	R^2	ΔR^2
Speed, Working Memory, Gf (Model 1B)	0.924		0.906		0.856	
Speed, Working Memory, Gf, Gc (Model 1A)	0.927	0.003	0.917	0.011	0.939	0.083
Speed, Working Memory (Model 1C)	0.887		0.904		0.730	
Speed, Working Memory, Gf (Model 1B)	0.924	0.037	0.906	0.002	0.856	0.126
Gf (Model 1D)	0.580		0.598		0.767	
Speed, Working Memory, Gf (Model 1B)	0.924	0.344	0.906	0.308	0.856	0.089
Working Memory (Model 1D)	0.868		0.887		0.676	
Speed, Working Memory (Model 1C)	0.887	0.019	0.904	0.017	0.730	0.054
Speed (Model 1D)	0.575		0.465		0.454	
Speed, Working Memory (Model 1C)	0.887	0.312	0.904	0.439	0.730	0.276

Note: R^2 is based on 1 minus the estimated residual variance of the Achievement Factor in the related model. The R^2 values listed in two adjacent rows are obtained from two models employing the indicated predictors. The model in the bottom row employs one or more predictors not included in the model above, and the ΔR^2 value stands for the R^2 increment caused by the additional predictor(s).

	Changes in model fit		
	6–8	9–13	14–19
	$\Delta\chi^2/\Delta df$	$\Delta\chi^2/\Delta df$	$\Delta\chi^2/\Delta df$
(1) Equivalent Model A: four predictors (Speed, Working Memory, Gf, and Gc)			
Impact of βGc	0.342†/1	8.031/1	76.224/1
Impact of β_{Speed} and $\beta_{\text{Working Memory}}$	192.840/2	240.168/2	116.473/2
(2) Equivalent Model B: three predictors (Speed, Working Memory, and Gf)			
Impact of β_{Gf}	5.207†/1	0.872†/1	89.396/1
Impact of β_{Speed} and $\beta_{\text{Working Memory}}$	95.689/2	309.044/2	104.191/2
(3) Equivalent Model C: two predictors (Speed and Working Memory)			
Impact of $\beta_{\text{Working Memory}}$	117.444/1	385.097/1	202.498/1
Impact of β_{Speed}	4.862†/1	12.503/1	66.321/1

Note: The impact of β coefficient(s) was evaluated by fixing the relevant β parameter(s) to zero, and calculating the chi-square change induced by the zero constraint(s) placed on the full model. Symbol † indicates the related chi-square change is insignificant at p=0.01.

Table 3
Zero-order correlations between aggregates of TBCP, WISC-R IQ scores, and MAT total scores based on WRTP data (Age: 6–13, N=512)

	WISC-R Verb. IQ	WISC-R Perf. IQ	WISC-R Full IQ	Age-adjusted MAT Total	WRTP processing speed aggregate
WISC-R Perf. IQ	0.661				
WISC-R Full IQ	0.820	0.878			
Age-adjusted MAT Total	0.677	0.505	0.678		
WRTP Processing Speed Aggregate	0.464	0.575	0.571	0.635	
WRTP STM/Working Memory Aggregate	0.563	0.539	0.616	0.600	0.506

Table 4
R^2s and R^2 increments on Composition Levels 1, 2, and 3 of WRTP data analysis (Age: 6–13, N=512)

Criterion measure: age-adjusted MAT Total Achievement		
	R^2	ΔR^2
Composition Level 1		
STM/Working Memory Aggregate	0.360	
Processing Speed and STM/Working Memory Aggregates	0.505	0.135
Processing Speed Aggregate	0.404	
Processing Speed and STM/Working Memory Aggregates	0.505	0.101
Performance IQ	0.255	
Processing Speed Aggregate and Perf. IQ	0.433	0.178
Processing Speed Aggregate	0.404	
Processing Speed Aggregate and Perf. IQ	0.433	0.029[a]
Performance IQ	0.255	
STM/Working Memory Aggregate and Perf. IQ	0.406	0.151
STM/Working Memory Aggregate	0.360	
STM/Working Memory Aggregate and Perf. IQ	0.406	0.046
Composition Level 2		
Performance IQ	0.255	
Processing Speed+STM/Working Memory Composite and Perf. IQ	0.507	0.252
Processing Speed+STM/Working Memory Composite	0.503	
Processing Speed+STM/Working Memory Composite and Perf. IQ	0.507	0.004[a]
Verbal IQ	0.458	
Processing Speed+STM/Working Memory Composite and Verb IQ	0.605	0.147
Processing Speed+STM/Working Memory Composite	0.503	
Processing Speed+STM/Working Memory Composite and Verb IQ	0.605	0.102
Composition Level 3		
Processing Speed+STM/Working Memory+Verb IQ Composite	0.604	
Processing Speed+STM/Working Memory+Full IQ Composite	0.561	
Processing Speed+STM/Working Memory+Perf. IQ Composite	0.449	

Note: The R^2 values listed in two adjacent rows are obtained from two multiple regression models employing the indicated predictors. The model in the bottom row employs an additional predictor not included in the model above, and the ΔR^2 value stands for the R^2 increment caused by the additional predictor.

[a] Refers to non-significance at p=0.01.

Table 5
Results from SEM analyses of WRTP data (Age: 6–13, N=512)

Model fit indexes of the five-factor model

χ^2	df	TLI	CFI	RMSEA (95% confidence interval)
367.893	159	0.945	0.958	0.051 (0.043, 0.059)

Contributions of the WRTP Speed, WRTP STM/Working Memory, WISC Performance, and WISC Verbal Factors to the MAT Achievement Factor

R^2 changes in Achievement Factor

Predictors in model	R^2	ΔR^2
Speed, STM/Working Memory, Performance (Model 2B)	0.678	
Speed, STM/Working Memory, Performance, Verbal (Model 2A)	0.773	0.095
Speed, STM/Working Memory (Model 2C)	0.662	
Speed, STM/Working Memory, Performance (Model 2B)	0.678	0.016
Performance (Model 2D)	0.277	
Speed, STM/Working Memory, Performance (Model 2B)	0.678	0.401
STM/Working Memory (Model 2D)	0.564	
Speed, STM/Working Memory (Model 2C)	0.662	0.098
Speed (Model 2D)	0.629	
Speed, STM/Working Memory (Model 2C)	0.662	0.039

Note: R^2 is based on 1 minus the estimated residual variance of the Achievement Factor in the related model. The R^2 values listed in two adjacent rows are obtained from two models employing the indicated predictors. The model in the bottom row employs one or more predictors not included in the model above, and the ΔR^2 value stands for the R^2 increment caused by the additional predictor(s).

Changes in model fit

	$\Delta\chi^2/\Delta df$
(1) Equivalent Model A: four predictors (Speed, STM/Working Memory, Performance, and Verbal)	
Impact of β_{Verbal}	29.162/1
Impact of β_{Speed} and $\beta_{\text{STM/Working Memory}}$	147.703/2
(2) Equivalent Model B: three predictors (Speed, STM/Working Memory, and Performance)	
Impact of $\beta_{\text{Performance}}$	1.589†/1
Impact of β_{Speed} and $\beta_{\text{STM/Working Memory}}$	156.020./2
(3) Equivalent Model C: two predictors (Speed and STM/Working Memory)	
Impact of $\beta_{\text{STM/Working Memory}}$	7.695/1
Impact of β_{Speed}	18.849/1

Note: The impact of β coefficients was evaluated by fixing the relevant β parameter(s) to zero, and calculating the chi-square change induced by the zero constraint(s) placed on the full model. Symbol † indicates the related chi-square change is insignificant at p=0.01.

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